

Brightwater Marine Outfall Eelgrass Restoration: an 11 Year Odyssey

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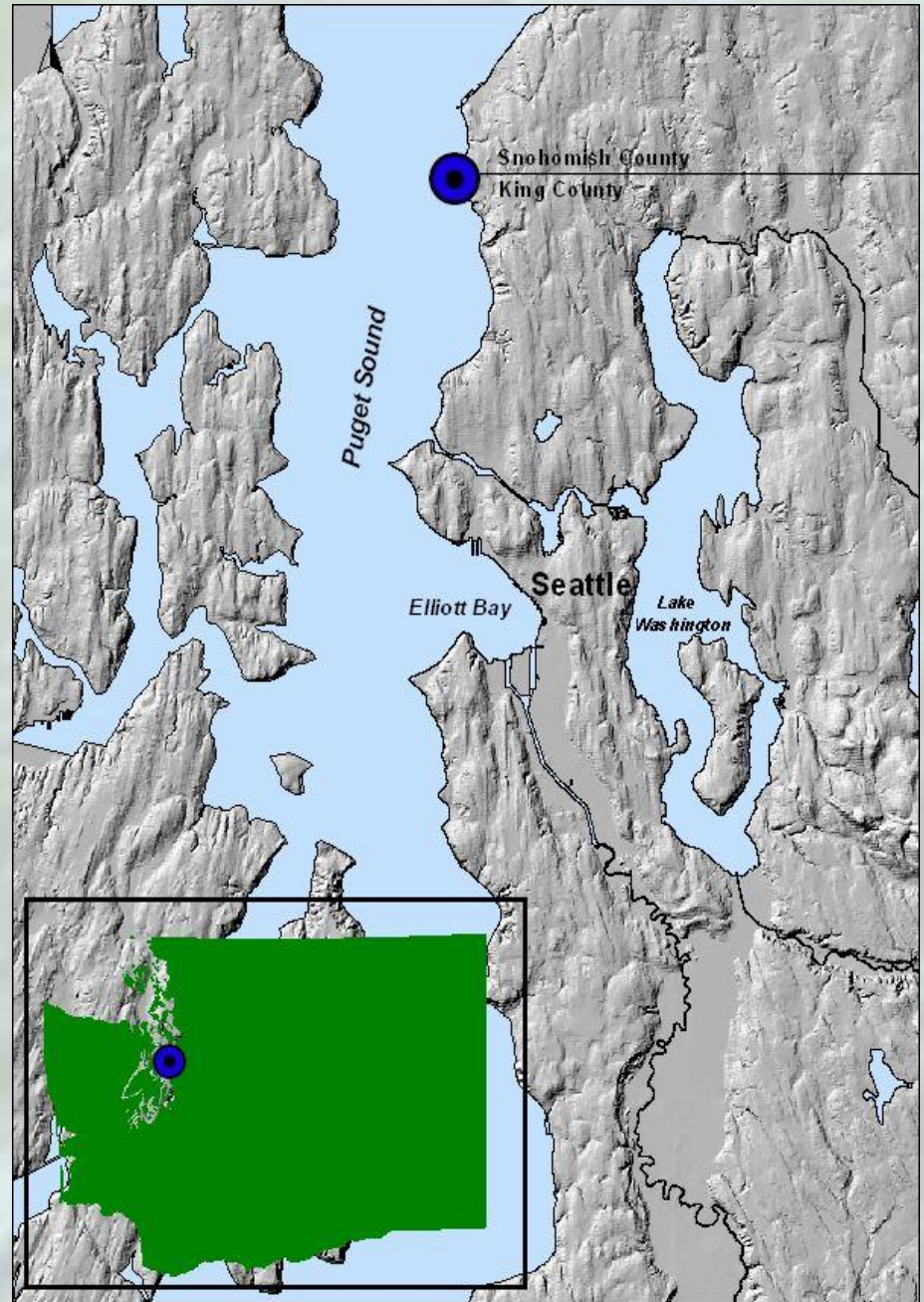
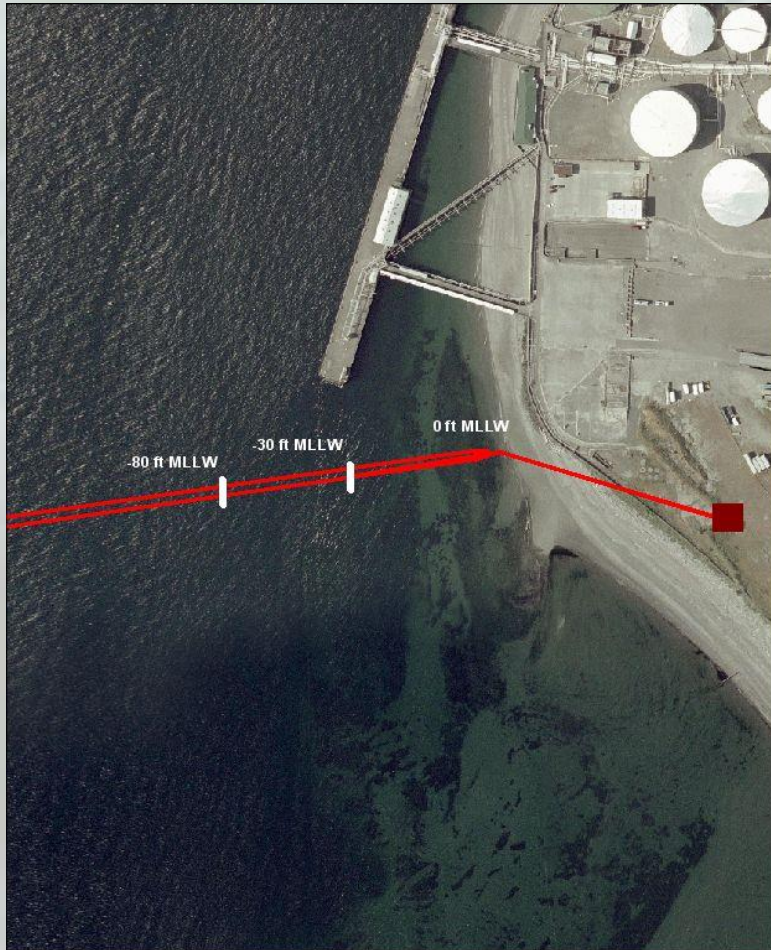
Washington State Dept. of Natural Resources

Laura Arber

Washington State Dept. of Fish and Wildlife

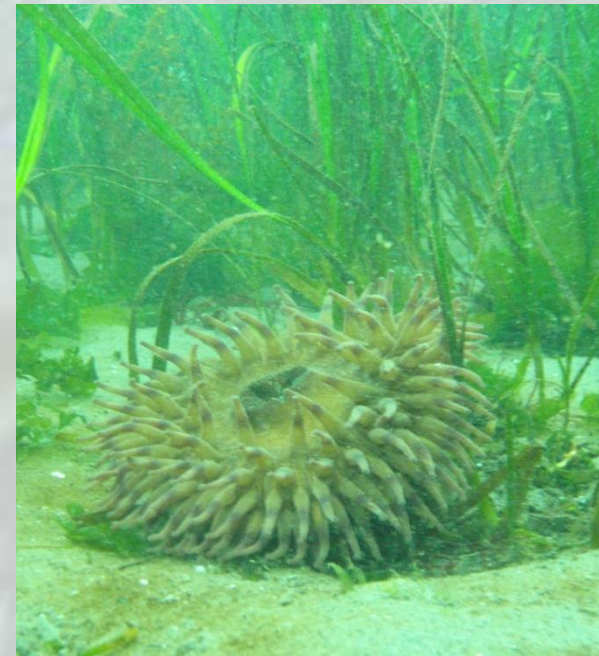


Why?



Why Care?



- Native perennial plant (*Zostera marina*) that forms meadows
- Nursery area for fish and shellfish
- Provides food & spawning habitat



Restoration Goal

To restore intertidal and shallow subtidal eelgrass habitat to pre-construction conditions

Performance Standards

-  Short-term (1-yr) survival of transplanted eelgrass constitutes no more than 50% loss in cover (area), or no greater than 75% loss in density.
-  Long-term (5-yr) survival of transplanted eelgrass is statistically equivalent to pre-construction abundance in the same area.









Brightwater
TREATMENT SYSTEM

Eelgrass Restoration and Biological Resources Implementation Workplan

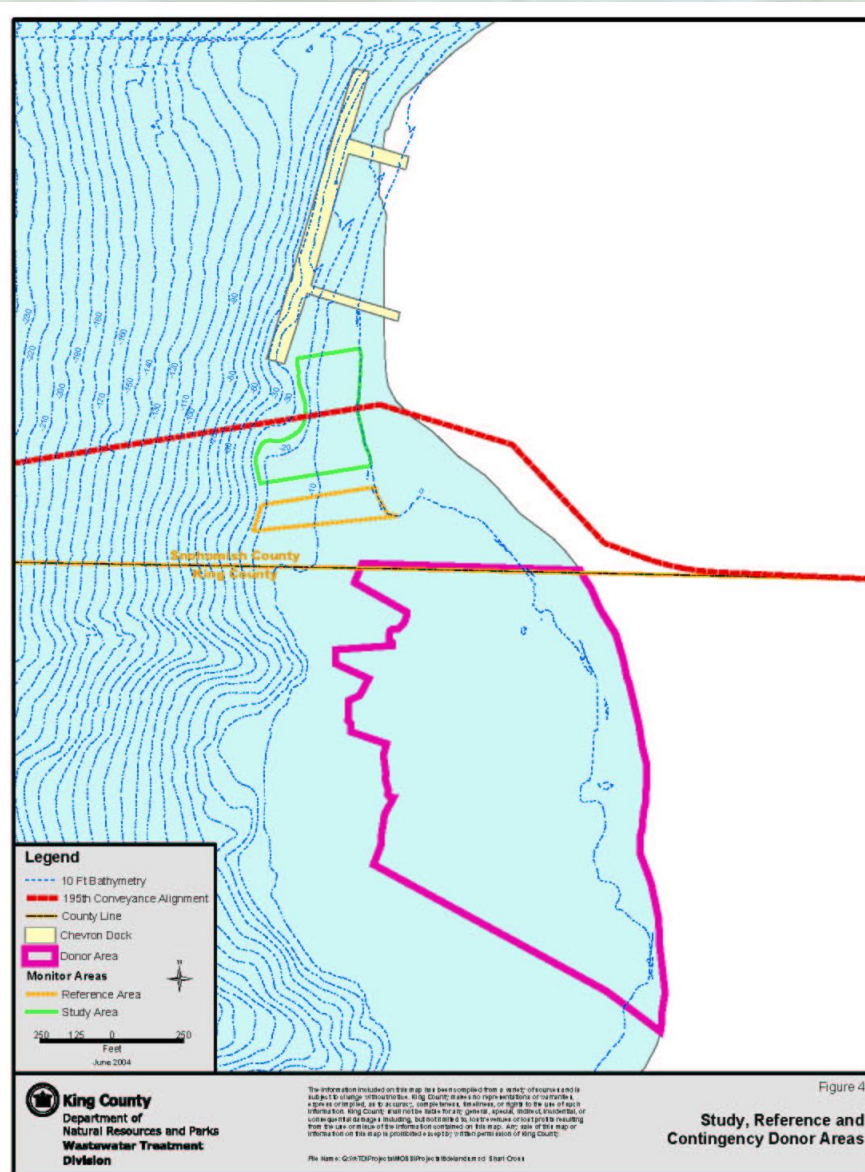
Revised April 2008

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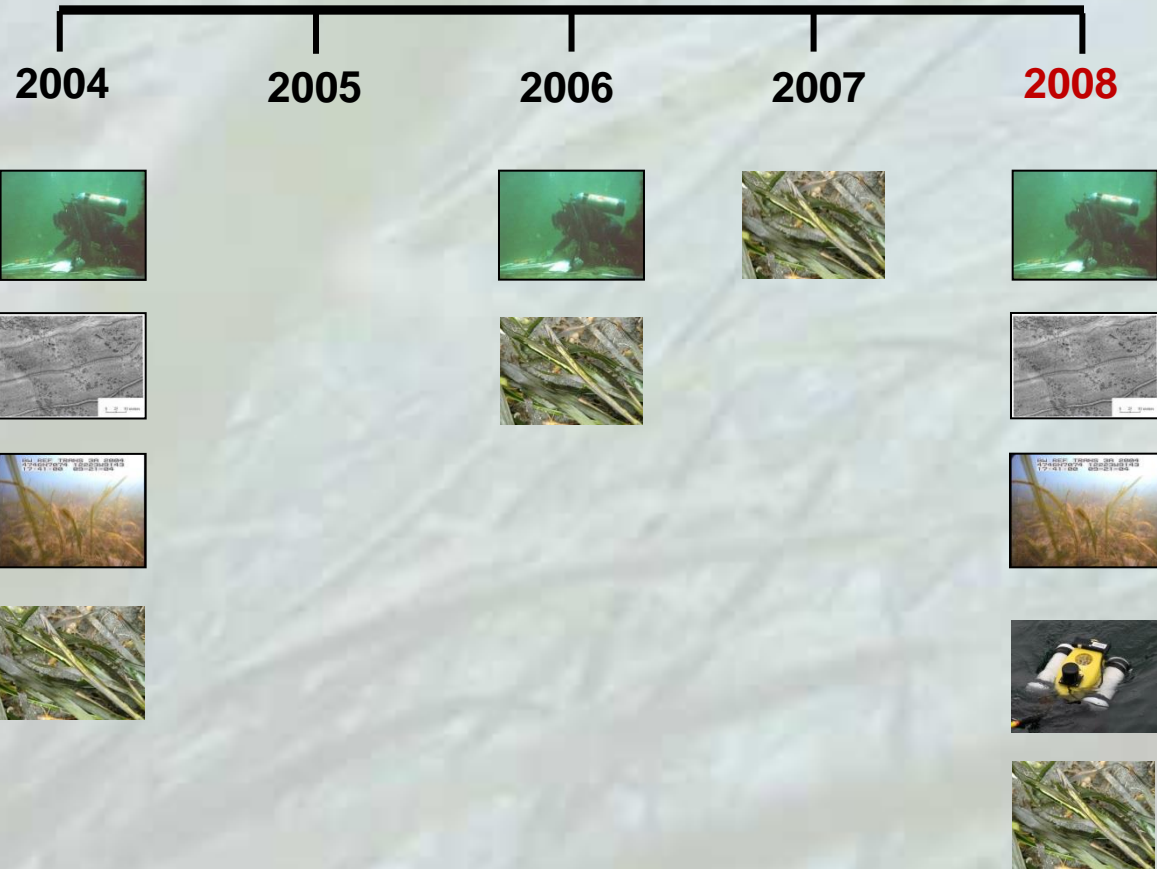
Restoration Plan Elements

-  Pre-construction surveys
-  Pre-construction harvesting & propagation
-  Experimental harvest plots
-  Transplant
-  Post-construction surveys
-  Contingency plan

Restoration Plan Areas



Pre-construction



divers



sonar



video



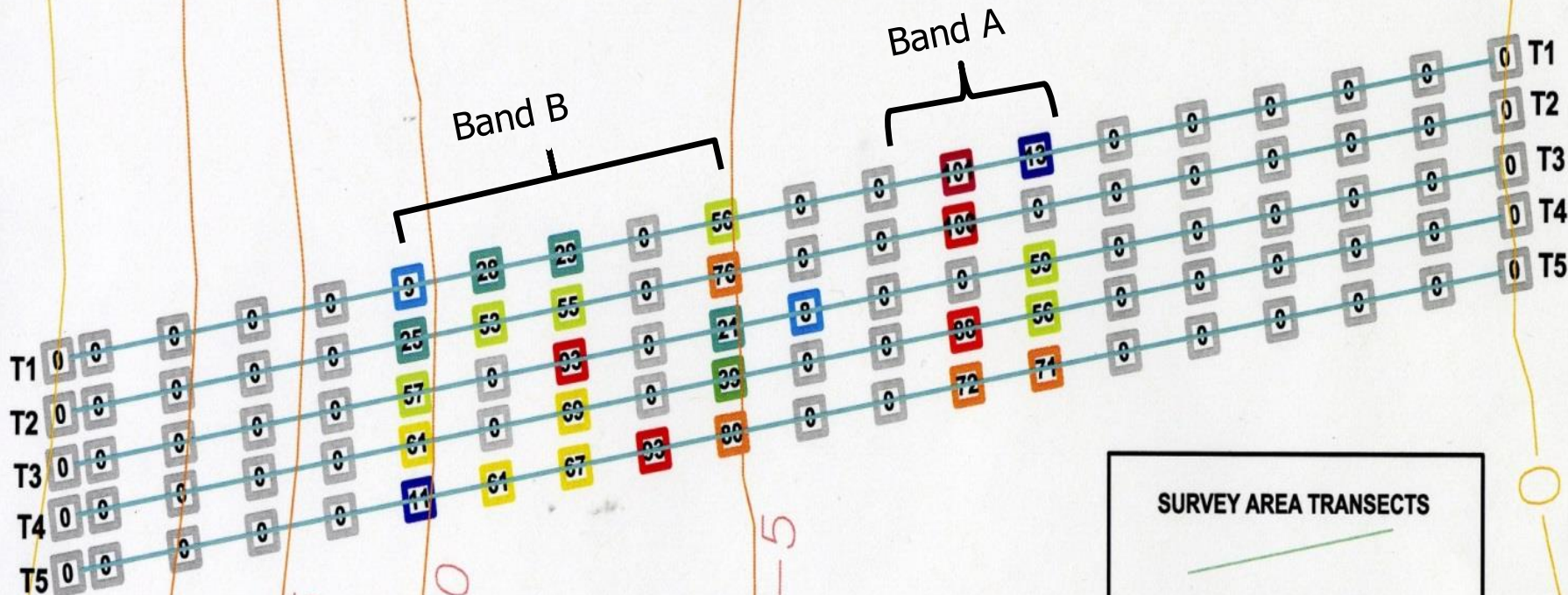
harvest



ROV

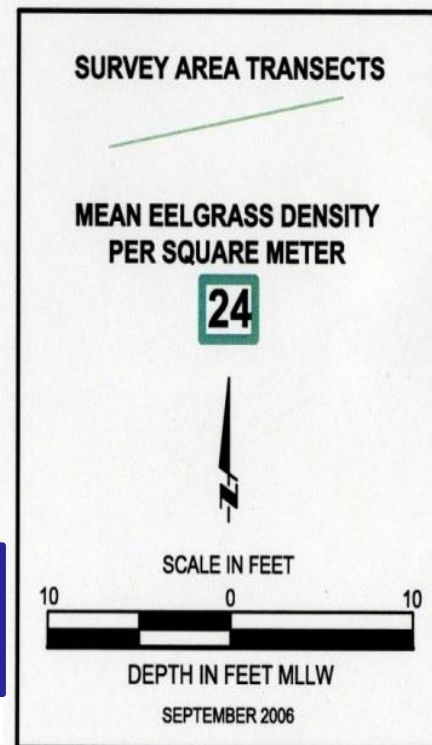


2008



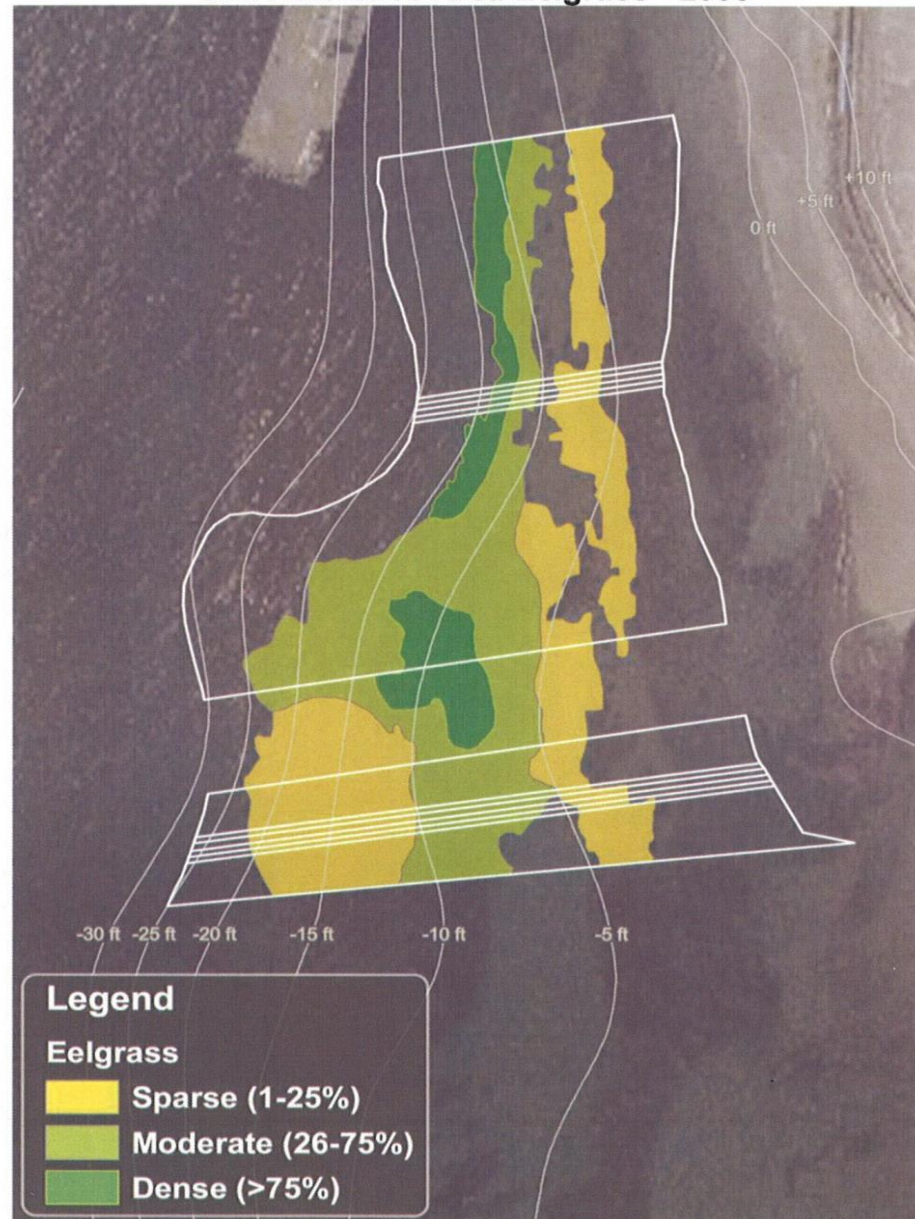
80 shoots/m²
26 shoots/m²

Grette Assoc.



PNNL

Brightwater Outfall Study Area and Reference Area Eelgrass - 2008



10 0 10 20 Meters

Eelgrass Coverage 2008
Aerial photo from USGS, June 2002



Harvest



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304 shoots in 2004
1,500 shoots in 2006
490 shoots in 2007

Grette

12,240 shoots in 2008

2004 305 shoots
2006 3,232 shoots
+1,500
2007 974 shoots
2008 14,096 shoots
2009 ~18,000 shoots

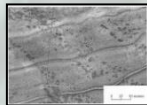


Post-construction

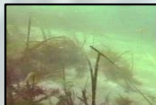
2009 2010 2011 2012 2013 2014



sonar



video



transplant



divers



ROV



May 2009







Transplant

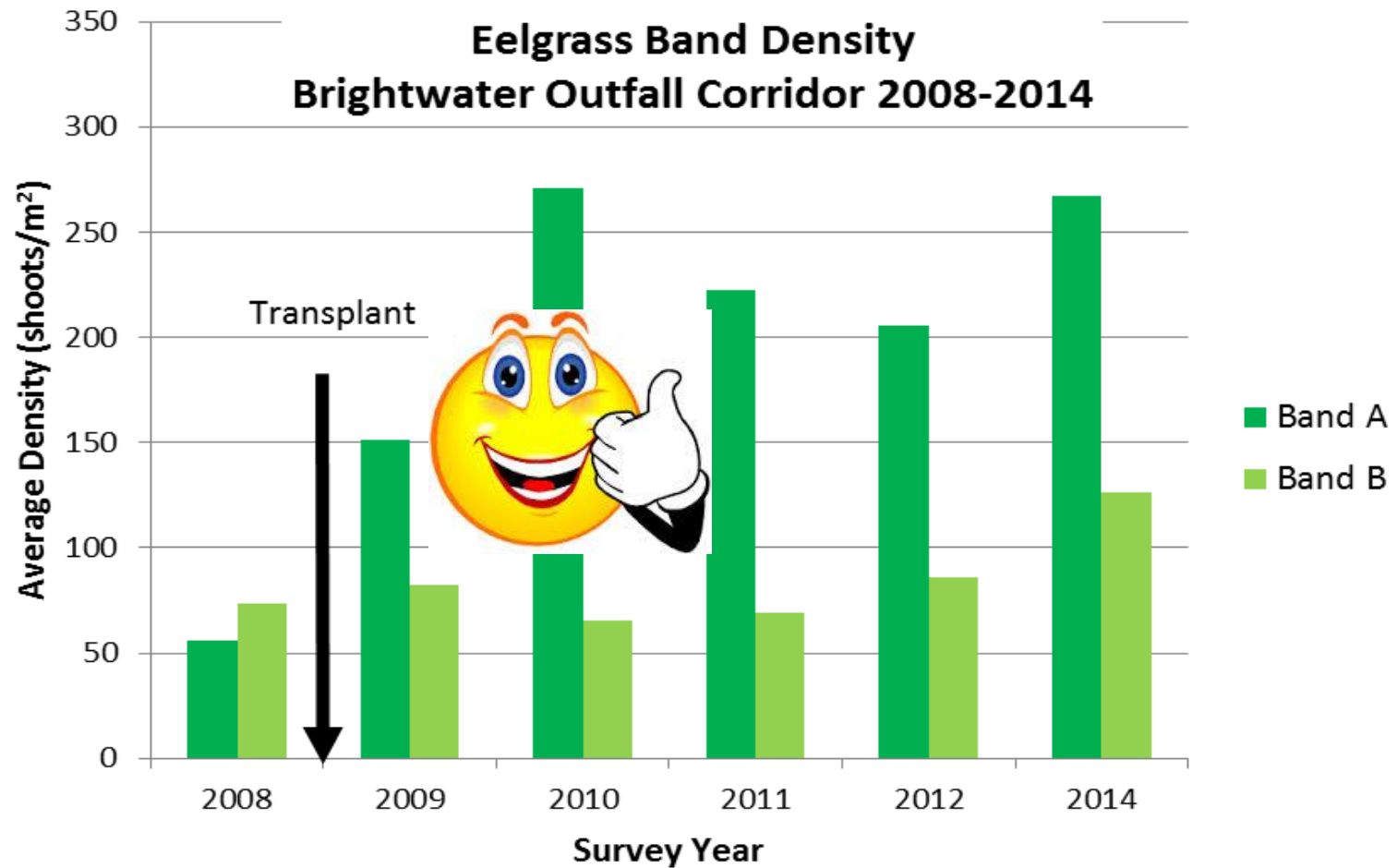




Post-construction

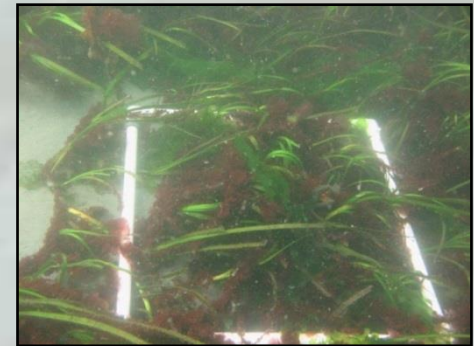


Eelgrass Band Density Brightwater Outfall Corridor 2008-2014



So.....

- Met the 2010 short-term performance standard for both areal coverage & density.
- Met the long-term survival performance standard. The 2014 density is statistically higher than pre-construction abundance in the same area. In 2008: **10,300** shoots, in 2014: **29,356** shoots
- Were able to restore the site without having to harvest from a donor site.



Acknowledgments

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Grette Associates

PNNL (Pacific Northwest National Lab.)

<http://green2.kingcounty.gov/marine/Publications>

